

**AMENDMENTS TO THE TITLE**

Please substitute the title in the current application with the following title:

CAPACITANCE TYPE FORCE SENSORS

**REMARKS**

Please reconsider this application in view of the following remarks. Applicant thanks the Examiner for carefully considering this application.

**Disposition of Claims**

Claims 3-17 were pending in this application. Claims 6-10 are canceled, and new claims 18-28 have been added. Therefore, claims 3-5 and 11-28 are pending after the amendments. Claims 3 and 18 are independent. Claims 4-17 depend, directly or indirectly, from claim 3. Claims 19-28 depend, directly or indirectly, from claim 18.

**Claim Amendments**

Claims 3-5 and 11-17 have been amended to clarify the invention recited. No new matter has been added by way of these amendments.

Claims 18-28 are new claims. These claims include a Schmitt logic element. No new matter has been added by way of this amendment as support for these new claims may be found, for example, in the originally filed claims.

**Preliminary Matters**

The Office Action was based on the original PCT claims, which should have been amended by Article 34 amendment during the international stage. Applicant verified on private PAIR that the USPTO indeed received the Article 34 amendment. Therefore, claims 1 and 2

should have been cancelled and certain other claims should have been amended as presented in the Article 34 amendment.

Applicant contacted the Examiner on April 10, 2006. The Examiner indicated that he might have overlooked the amendment. However, in the interest of moving this case forward, the Examiner suggested that we respond to the Office Action as much as we can. Thus, this response to the Office Action is based on the claims as amended by the Article 34 amendment.

**Objection to Title as being Non-Descriptive**

The title has been changed to "CAPACITANCE TYPE FORCE SENSORS." Applicant believes this is descriptive in light of the specification (especially, the background section). Accordingly, withdrawal of this objection is respectfully requested.

**Objection to Claims 5-17 as Being Improper Multiple Dependent Claims**

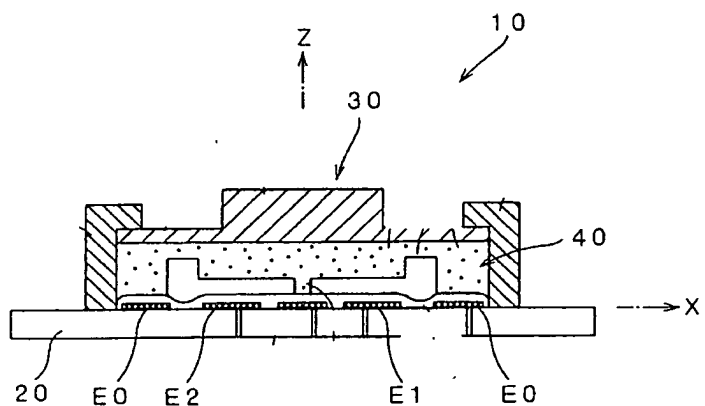
Claims 5 and 11-17 have been amended to remove the improper multiple dependency. Claims 6-10 have been cancelled. Accordingly, withdrawal of this objection is respectfully requested.

**Rejections under 35 U.S.C. § 103**

Claims 1-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,989,677 ("Morimoto") in view of U.S. Patent No. 4,719,538 ("Cox"). Claims 1 and 2 have been cancelled, rendering the rejection with respect to these claims moot. Claims 3

and 4 have been amended. To the extent this rejection may still apply to the amended claims, this rejection is respectfully traversed.

Embodiments of the present invention relates to capacitance type sensors. As recited in claim 1 and shown in FIG. 1 (reproduced below), a sensor **10** of the invention comprises (i) a substrate **20** that defines an XY plane of an XYZ three-dimensional coordinate system; (ii) a detective member **30** that is disposed opposite the substrate **20**; (iii) a conductive member **40** (e.g., a flexible/displaceable electrode) disposed between the substrate **20** and the detective member **30** so as to be Z-axially displaceable in accordance with Z-axial displacement of the detective member **30**; (iv) a capacitance element electrode (e.g.,  $E_1$  and  $E_2$ ) formed on the substrate **20** to cooperate with the conductive member **40** to form a first capacitance element; and (v) a reference electrode (e.g.,  $E_0$ ) formed on the substrate **20** to cooperate with the conductive member **40** to form a second capacitance element, and kept at a ground potential or another fixed potential.



**FIG. 1**

As shown in FIG. 6 of the instant application, pushing on the detection member **30** will alter the distance between the conductive member **40** (which, in this example, is a flexible electrode) and the capacitance element electrodes ( $E_1$ ,  $E_2$ ). This change in distance results in a change in the capacitance, which can be detected as an electrical signal.

The analog signals generated by the sensors are processed by a signal processing circuit that has hysteric characteristics. Examples of signal processing circuits having hysteric characteristics include Schmitt type triggers, which, for example, may output a signal value corresponding to the input signal until the input signal increases above an upper threshold or drops below a lower threshold. Thus, a Schmitt trigger (or any other device with hysteric characteristics) is immune to small signal fluctuations due to noises in the signals. In accordance with some embodiments of the invention, the upper threshold (deviation from a reference value) is larger than the lower threshold (such that the Schmitt trigger will have a larger dynamic range).

In accordance with some embodiments of the invention, the output from the signal processing circuit with hysteric characteristics is then input into a logic element, which in turn produces an output signal. (see FIG. 7 of the instant application). Note that the signal processing circuit with hysteric characteristics is disposed at the input side of the logic element.

Independent claim 3 includes a limitation, “after each of analog signals . . . has passed the respective signal processing circuit having hysteretic characteristics and the analog signal are input to a logic element, a output signal is output from the logic element.”

In contrast, Morimoto and Cox, whether considered separately or in combination, fail to teach or suggest a sensor as recited in claim 3 or 18.

Morimoto discloses a sensor similar to that disclosed in the present invention. However, Morimoto fails to teach or suggest a signal processing circuit having hysteric characteristics, as acknowledged by the Examiner. Instead, the Examiner relies on Cox to teach a signal processing unit having hysteric characteristics. (Office Action, p. 3, last 5 lines).

However, Cox discloses a circuit having a Schmitt trigger disposed at the output side of a logic element. In Cox, a capacitive force transducer contains a low pass filter disposed at the output side of a XOR logic element, and a Schmitt trigger device is in turn connected to the output side of the low pass filter, as shown in Figure 5. Thus, in Cox, a logic signal from the XOR logic element is the first processed by the low pass filter and then fed to a Schmitt trigger. In this scheme, the Schmitt trigger functions to prevent chattering of a logic signal and to perform wave shaping. Thus, the signal processing scheme and the function of the Schmitt trigger device in Cox are distinct from those of the instant application.

In view of the above, Morimoto and Cox, whether considered separately or in combination, fail to teach or suggest at least one limitation recited in independent claim 3. Thus, claim 3 is patentable over Morimoto and Cox. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

#### **New claims**

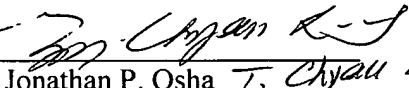
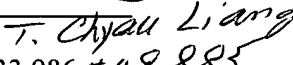
Independent claim 18 includes a similar signal processing circuit that employs a logic element having a Schmitt trigger, as shown in FIGs. 8 and 9 of the instant invention. Neither Morimoto nor Cox discloses such a limitation. Therefore, claim 18 is patentable. Dependent claims 19-28 should also be patentable for at least the same reasons.

**Conclusion**

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 07700/061001).

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Respectfully submitted,

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